Environmental Considerations of Proppant Frac Sand Mining and Processing

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Introduction & Background
New Energy Boom
Frac Sand Basics

► Proppant
  ▪ Silica Sand
  ▪ High Crush
  ▪ Spherical
  ▪ Acid Resistance

► Mesh Sizes
  ▪ 20/40
  ▪ 30/50
  ▪ 40/70
  ▪ 70/140

20/40 White Sand
Well Stimulation
Frac Sand Mines

- Multi-billion Dollar Industry
- Locations
  - Arkansas, *Wisconsin, Illinois, Oklahoma, Texas, Minnesota, Louisiana, Mississippi
- Mine Types - Primarily
  - Surface
  - Dredging
  - Quarry
Typical Frac Sand Operations

► Mine
  ▪ Material Excavation
  ▪ Stockpile

► Wet Plant
  ▪ Initial Screening
  ▪ Washing Process

► Dry Plant
  ▪ Direct Heat Application
  ▪ Final Screening
  ▪ Storage
Site Challenges – Frac Sand Mine

► Location
  - Population / Cities
► Water Resources
  - Surface / Groundwater
► Traffic
  - Trucks / Rail
► Utilities
  - Gas / Power
► Topography
  - Mountains / River

Mining & Reclamation Plan Development
Frac Sand Mine
Environmental Concerns

► Air Quality
- Blasting / Excavating Emissions
- Road Emissions
- New PM2.5 Standard
- NOx Regulations
Frac Sand Mine
Environmental Concerns

► Water Quality
  - SEDIMENT!
  - Wet Plant Treatment Chemicals
General Permitting Requirements

► Quarry/Mining Permit – Reclamation Requirements
► Air Quality Permit
► Individual State NPDES Water Permit
► Construction SW3P
► Industrial SW3P
► Field Determination of USACE Jurisdiction
► Nation-Wide Permit (s)
► Driveway Permit
Frac Sand Mining Plans

1) – Assess Quality of Deposit
2) - Reserve Analysis
3) – Site Location Review
4) – Environmental Considerations
5) – Design of Operation
Frac Sand Mine Reclamation Plans

Typical Features

- Utilization of Buffers
- Permanent Water Lake / Ponds
- Replacement of Overburden Stockpiles & Grade to Predetermined Contours
- Revegetation of Exposed Soils W/ Native Plants
Case Study
(Evergreen Processing - Calico Rock, AR)

► Approx. 1300 Acres On the South Side of Hwy 56
► Proposed Fractionation Sand and Limestone Quarry
► Wet/Dry Processing Plants for Fractionation Sand
► Overburden – Limestone
► Sandstone – Requires Blasting / Crushing
Evergreen Location

Mine Site
Site Photos

Bailey Creek
Low Water Crossing

Pearoque Branch
5 Year Quarry Plan

Processing Plants

Conveyor to Plants
Proposed Engineered Wetlands for Biological Sediment Filtration

Retention Pond for Water Re-use and Water Quality

Sediment Basins for Water Quality

Riparian Buffers for Stream and Habitat Protection

Proposed Engineered Wetlands for Biological Sediment Filtration
Environmental Protection Measures

► **Engineered wetlands**: removes sediment and other pollutants from the water.

► **Settling ponds/Retention ponds**: fine particles are removed from the water by force of gravity. These particles then do not enter nearby streams.

► **Riparian Buffers**: 100-foot buffers on each side of stream to protect water quality, prevent erosion, and preserve habitat.

► Increased frequency of **water quality sampling** above required standards.

► **Erosion control** when building roads and fractionation sand plant.

► **Tree buffer** around entire property.
Case Study
(Northern Frac Sand – Dawes Creek, WI)

► Proposed Sand Mine – Surface Excavation
► 10-15’ Soil Overburden
► Glacial Deposit – Ottawa Sand
Typical Wisconsin Sand Mine
Case Study
(Completion Industrial Minerals – Pittsville, WI)

- Proposed Sand Mine – Surface Excavation
- 5-10’ Soil Overburden
Lessons

- Frac sand mines are expanding
- Water resources are limiting availability
- Environmental protection will continue to be a priority
- Reclamation will be driven by stakeholders and available resources
The End
Questions & Thanks!!

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